UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/753,608	01/08/2004	Robert L. Fair	112056-0148	6334

24267 7590 07/14/2008
CESARI AND MCKENNA, LLP
88 BLACK FALCON AVENUE
BOSTON, MA 02210

EXAMINER	
PORTKA, GARY J	
ART UNIT	PAPER NUMBER
2188	
MAIL DATE	DELIVERY MODE
07/14/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/753,608	FAIR, ROBERT L.	
	Examiner	Art Unit	
	Gary J. Portka	2188	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 April 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-72* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-72* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 16, 2008 has been entered.

2. Claims 1, 16, 22, 28, 34, 39, 41, 44, 49, 54, 69 and 71 have been amended by Applicant. Claims 1-72 are pending.

Response to Arguments

3. Applicant's arguments submitted on April 16, 2008, have been fully considered but are not persuasive. Applicants argue that Permut does not teach 1) a plurality of readset data structures for a selected file, 2) selecting an amount of readahead data based on factors within the readset data structures, and 3) updating the readset data structure if it meets criteria. Regarding argument 1), Examiner does not agree, since as cited below Permut provides multiple streams for a logical unit; alternatively, since stored data may be considered files and accessed multiple times, each access may be considered a read stream for the file. Regarding argument 2), the data structures of Figs. 1 and 2, further described below, provide for selecting an amount of readahead data, and for example as described at Permut col. 6 lines 25-36. Regarding argument

3), since Permut provides for adding and changing the data structures, criteria for updating them is disclosed, as further cited below.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-21, 28-33, and 71-72 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Each of the independent claims of the above recite in the last paragraph "the readahead data structure". It is not clear if this is intended to be a separate data structure, or if it refers to the previously recited "readset data structure".

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-14 & 16-72 are rejected under 35 U.S.C. 102(b) as being anticipated by Permut et al. (US Patent # 6,260,115), herein Permut.

8. As to claim 22, Permut discloses *a method, apparatus with means for, storage system, and computer readable media with instructions for having a storage operating system implemented in a storage system to optimize the amount of readahead data retrieved for a read stream established in a data container stored in the storage system,*

the method comprising: receiving a client read request at the storage system at a network adapter, the client read request for a particular read stream [Figure 7A, #700, for a particular read stream since any request will be for particular data that is sent as a read stream]; *locating a readset data structure for the read stream* (since the command fields or flags at col. 8 lines 59-60 providing hints must be "located" to the extent claimed, and these hints indicate how far to read ahead, thus for a corresponding read stream)*, determining whether the storage operating system is permitted to retrieve readahead data from the data container in response to the received client read request* [Figure 7A, #702]; *if it is determined that the storage operating system is permitted to retrieve readahead data from the data container* ["Yes" branch of Figure 7A, #702 & #704], *performing the steps of: (i) selecting an amount of readahead data to retrieve from the data container based on a plurality of factors* ["Yes" branch of Figure 7A, #704 & Figure 7B, #720] *stored within a readset data structure associated with the read stream* [seeing the data structure as the fields of Fig. 2]; *and (ii) retrieving the selected amount of readahead data from the data container* [Figure 7B, #729, col. 1 lines 19-22, Column 3, Lines 31-49, Column 8, Line 46 – Column 9, Line 8 & Column 10, Lines 32-59].

9. As per claims 34, 39, 41, 44, 49, and 69, Permut discloses the invention substantially as described above with regard to claim 22. The additional limitations that files are maintained, and that for a selected file a plurality of readset data structures holding factors for a selected read stream are maintained is disclosed since Permut clearly provides multiple streams for a single logical unit (col. 1 lines 11-14, col. 2 lines

31-37), also the logical unit may be considered as any desired unit (col. 8 lines 50-52), and thus a file as recited. Alternatively, since any read stream comes from stored data that may be considered a file, any file can be read multiple times, resulting in multiple read streams as recited.

10. As to claims 1, 16, 28, and 71, Permut discloses the invention substantially as described above with regard to claims 34 etc. The additional limitation of determining if the data structure meets a criteria for updating, and updating it if so, is disclosed at the cited passages of col. 5, where slots "are used to record entries … of detected sequential access patterns", and also where number slots "increases, more entries can be recorded", which clearly provides for updating read data structures based upon a criteria as recited.

11. As to claims 54 and 55, Permut discloses the method substantially as described above; *adjusting as requests are processed, the plurality of factors stored within the data structure associated with each stream to optimize amount of readahead data is cached for each read stream* is also disclosed [the processing of multiple host requests, each with their associated prestage commands or flags, is seen as the adjustment of the data structure as recited, also see Column 8, Line 46 – Column 9, Line 8 & Column 10, Lines 32-59].

12. As to claims 2, 17, 23, 29, 43, and 56, Permut further discloses *wherein the data container is a file, directory, vdisk or lun* [Column 1, Lines 12-33 & Column 2, Lines 29-48].

13. As to claims 3, 18, 24, and 57, Permut further discloses *wherein the storage operating system is determined to be permitted to retrieve readahead data from the data container when the client-requested data extends the read stream past a predetermined next readahead value* [Figure 7B, #722, #732, #734 & Column 11, Lines 38-48].

14. As to claims 4 and 58, Permut further discloses *wherein the predetermined next readahead value is stored in a readset data structure associated with the read stream* [Figure 2, #200, #204, #210 & Column 11, Lines 38-48].

15. As to claims 5, 19, 25, and 59, Permut further discloses *wherein the predetermined next readahead value is updated based on a percentage of the selected amount of readahead data* [Figure 7B, #740, #742, #744 & Column 11, Line 60 – Column 12, Line 12].

16. As to claims 6 and 60, Permut further discloses *wherein a read-access style associated with the data container is one of the plurality of factors used to select the amount of readahead data* [Figure 2, #206 & Column 4, Lines 30-39].

17. As to claims 7, 40, and 61, Permut further discloses *wherein the selected amount of readahead data equals zero if the read-access style corresponds to a random read-access style* [Column 2, Lines 51-66, Column 4, Lines 40-52 & Column 6, Lines 16-47].

18. As to claims 8 and 62, Permut further discloses *wherein a number of client read requests processed in the read stream is one of the plurality of factors used to select the amount of readahead data* [Column 4, Lines 53-67].

19. As to claims 9 and 63, Permut further discloses *wherein the number of client read requests processed in the read stream is stored as a count value in a readset data structure associated with the read stream* [Figure 2, #208].

20. As to claims 10 and 64, Permut further discloses *wherein the amount of client-requested data is one of the plurality of factors used to select the amount of readahead data* [Column 5, Lines 1-6].

21. As to claims 11, 38, and 65, Permut further discloses *wherein the selected amount of readahead data is set equal to a predetermined upper limit for large amounts of client-requested data* [Column 4, Lines 7-21].

22. As to claims 12, 27, 35, 36, and 66, Permut further discloses *wherein the selected amount of readahead data is doubled if the number of client read requests processed in the read stream is greater than a first threshold value* [Column 10, Lines 47-59].

23. As to claims 13, 31, 46, 51, and 67, Permut further discloses *wherein the client-requested data is identified as read-once data when either (i) the number of client read requests processed in the read stream is greater than a second threshold value* [Figure 2, #208 & Column 4, Lines 6-21] *or (ii) a set of metadata associated with the read stream indicates that the client-requested data is read-once data* [Figure 2, #206 & Column 11, Lines 38-48; an entry's position on a candidate list, as disclosed by Permut, is functionally equivalent to "metadata" claimed by applicant because they both identify read-once data requested from a client].

24. As to claims 14, 30, 32, 33, 45, 47, 48, 50, 52, 53, and 68, Permut further discloses *wherein the selected amount of readahead data is stored in one or more buffers enqueued on a flush queue, the flush queue being configured to reuse buffers after a predetermined period of time* [Column 3, Lines 11-30 & Column 5, Lines 15-18].

25. As to claims 20 and 26, Permut further discloses *wherein the plurality of factors used to select the amount of readahead data includes at least one of: (i) the amount of client-requested data* [Column 5, Lines 1-6], *(ii) a number of client read requests processed in the read stream* [Column 4, Lines 53-67], *and (iii) a read-access style associated with the data container* [Figure 2, #206 & Column 4, Lines 30-39].

26. As to claim 21, Permut further discloses *wherein the selected amount of readahead data is doubled if the number of client read requests processed in the read stream is greater than a first threshold value* [Column 10, Lines 47-59].

27. As to claim 37, Permut further discloses the method of claim 36, further comprising the step of rounding, the selected amount of readahead data to the size of a data block [Column 1, Lines 55-59]. *Examiner understands that Permut teaches prestaging whole data blocks, which would inherently require a rounding step to achieve such prestaging.*

28. As to claim 42, Permut further discloses *wherein the step of selecting an amount of readahead data further comprises: determining whether a flag is associated with the read stream* [Figure 2, #202], *the flag indicating that the storage system is associated with more than a predetermined number of storage devices* [Column 9, Lines 46]; *and in*

response to determining whether the flag is associated, selecting the amount of readahead data [Column 9, Lines 43-56; Permut sets the Flags 202 to active/inactive depending on whether the entry is referenced by the storage systems and is functionally equivalent to the flags claimed by Applicant].

29. As to claims 70 and 72, Permut discloses *allocating more readsets for the file in response to processing one or more write requests to the file* (since any writes involve more data which will introduce new read requests with new hints corresponding thereto).

Claim Rejections - 35 USC § 103

30. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

31. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Permut et al. (US Patent # 6,260,115) as applied to Claims 1 & 14 above, and further in view of Vishlitzky et al. (US Patent # 5,649,156), herein Vishlitzky.

32. As to claim 15, Permut does not expressly disclose a *2 second queue refresh period*. However, Vishlitzky discloses the method of claim 14, wherein the predetermined period of time equals two seconds [Column 7, Lines 41-52]. Furthermore, Permut and Vishlitzky are analogous art because they are from the same problem solving area: Prefetch cache optimization in multi-stream data storage

systems. At the time of invention, it would have been obvious to a person of ordinary skill in the art to modify the sequential prestaging queue flush, as taught by Permut, to refresh with a period of 2 seconds, as taught by Vishlitzky to be well known in the art. The suggestion/motivation for doing so would have been for the benefit of balancing a minimum amount of open storage and a maximize amount of data stored in the queue, as taught by Permut in Column 2, Line 51 - Column 3, Line 10, and because after 2 seconds of inactivity, the chances are small that data will not be accessed again within a reasonable period of time, as taught by Vishlitzky.

Conclusion

33. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gary J. Portka whose telephone number is (571) 272-4211. The examiner can normally be reached on M-F 9:30 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hyung Sough can be reached on (571) 272-6799. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Gary J Portka/
Primary Examiner, Art Unit 2188
July 10, 2008